

## REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendment and the following remarks.

Claims 2-20 were pending in this application. In this Amendment, claims 2-12, 15-16, and 18 have been amended and no claims have been added or canceled. Accordingly, upon entry of this Amendment, claims 2-20 will remain pending.

In the final Office Action mailed December 11, 2008, the Examiner rejected claims 2-7, 10, 12, and 16 under 35 U.S.C. § 102(b) as being anticipated by EP 0930641 A2 to Kiguchi et al. ("Kiguchi"). Under 35 U.S.C. § 103(a), the Examiner rejected claims 8, 9, 11, 13-15, and 17-20 as being unpatentable over Kiguchi in view of U.S. Patent No. 6,655,791 to Crockett et al. ("Crockett"). In an Advisory Action mailed April 3, 2009, the Examiner maintained those grounds of rejection. To the extent that these rejections might still be applied to the claims currently pending, Applicants respectfully traverse the rejections.

In this Amendment, Applicants have amended independent claims 2, 12, and 18 to more clearly recite the invention. Claims 3-11 and 15-16 have been amended to correct minor matters of form to conform to the changes made to the independent claims.

To further highlight the invention, Applicants have amended the independent claims to recite an apparatus in which the tubular dispensing means comprises a dispensing tube that is disposed substantially horizontally in a plane parallel to the horizontal substrate, wherein the dispensing tube includes a wall that defines lateral outlet openings. Support for this amendment can be found, for example, in Figure 1, which discloses a horizontal dispensing tube 2, and in the

appurtenant text of the specification. As recited in the claims, the apparatus is for applying a layer of a second material to a layer of a nanocrystalline first material that is disposed on a horizontal substrate. Thus, as illustrated in the side view shown in Figure 1, the horizontal dispensing tube lies generally in a plane parallel to the substrate that contains the layer of the nanocrystalline first material. The claimed dispensing tube further has a number of lateral outlet openings in the wall of the dispensing tube. This is clearly disclosed in the present specification at paragraph [0024], specifically in the portions that describe embodiments of the present invention in which the dispensing tube is a (hollow) needle, having an internal diameter of about 0.4 mm, and outlet openings having a diameter of about 0.1 mm.

In one embodiment of the present invention, as recited in claim 18, for example, the lateral outlet openings are provided on a top side of the dispensing tube. As disclosed in the specification, by providing lateral outlet openings on a top side of the dispensing tube, that is, on a side that is facing away from the substrate onto which the second layer is to be deposited, an exceptionally homogeneous layer is formed. This inventive arrangement and technique provides surprising results and advantages over known techniques for applying a second layer to a nanocrystalline layer, such as using an Eppendorf dispenser to drip solution onto a substrate, which technique was found to form layers having thicknesses varying from 15 to 30 micrometers, as disclosed in paragraph [0004] of this application.

As noted in previous responses, Applicants respectfully disagree with the Examiner's position that the ink jet printer of Kiguchi reads on the claims of this application. In particular, as noted previously, the system of Kiguchi as disclosed in Figures 18 and 19 is a rectangular ink-jet print head having several nozzles (211) configured to dispense ink. The nozzles 211 appear

to be generally circular/elliptical. The Examiner appears to refer to the individual circular nozzles as having "some depth." Applicants note that one of ordinary skill in the art would readily appreciate that this depth cannot be greater than the nozzle plate 21 thickness, which is depicted as very thin. Thus, the printer of Kiguchi includes a rectangular nozzle plate having somewhat circular shallow holes. In other words, Kiguchi discloses a *rectangular* dispensing means with shallow holes. The claims of this application, however, recite a *tubular* dispensing means comprising a dispensing tube that includes a wall that defines lateral outlet openings.

Even if one were to adopt the position that the shallow holes themselves are "tubular dispensing means," the nozzle plate of Kiguchi fails to read on the present claims because the shallow holes cannot be considered to simultaneously correspond to two claim elements, *i.e.*, the recited tubular dispensing means *and* the recited lateral openings.

Moreover, in contrast to the present invention, the nozzles of Kiguchi are *vertically* disposed with respect to a horizontal substrate that is to be coated. This is evident from Figures 16, 17, and 18. Figure 18 depicts holes 211 that are oriented vertically. Figures 16 and 17 depict side and top views of a substrate 1 in which patterns of droplets 11 are deposited. Although nozzles are not explicitly depicted in Figures 16 and 17 of Kiguchi, it would be readily apparent to one of ordinary skill in the art upon inspection of the figures that the liquid droplets 11 falling from inkjet head 2 onto horizontal substrate 1 must be exiting from holes that are oriented vertically with respect to the horizontal substrate 1. This is evident from Figure 16 of Kiguchi, which depicts a drop 11 that is dropping from printer head 2 towards substrate 1 arranged horizontally below the printer head. If holes 211 were arranged in a horizontal tubular fashion in such a configuration, that is, if the holes opened onto the vertical surfaces of printer head 2,

liquid would run down the vertical sides of the printer head, rendering the printer inoperable for its well recognized purpose of patterning substrates (see Abstract).

In the Advisory Action, the Examiner appears to adopt the position that the recitation of a horizontal orientation for the tubular dispensing means of the present invention is met even if the orientation of the ink jet head of Kiguchi is "an alternate orientation." However, the present claims recite that the tube that dispenses liquid is disposed substantially horizontally in a plane that is parallel to the horizontal substrate. In other words, the present claims do preclude arrangements in which the dispensing tube is in a plane orthogonal to the substrate, that is, the dispensing tube of the present invention cannot be "vertical," while the substrate is "horizontal." In contrast, for the nozzle plate 21 the printer of Kiguchi to be operable, the *nozzle plate 21* must be parallel to the substrate to be printed on, whether that nozzle plate is deemed horizontal or vertical. Because the tubes 221 extend through the nozzle plate 21 in a direction orthogonal to the nozzle plate, the nozzle plate arrangement requires that the "tubes" 221 be orthogonal to the surface being printed upon. Accordingly, the tubes 221 of Kiguchi cannot be disposed in a horizontal plane that is parallel to a horizontal substrate.

Thus, the claimed invention differs from the inkjet of Kiguchi in at least the following features. First, in the present invention, the orientation (recited as "horizontal") of the dispensing tube is similar to that of the substrate (also recited as "horizontal") to be coated, while, to the extent that the nozzles of Kiguchi can be considered dispensing tubes, which Applicants submit that they cannot, the orientation of the nozzles is in an orthogonal direction to the substrate to be coated. Second, the tubular dispensing means of the present invention, as recited in the presently amended claims, comprises a *dispensing tube*, while Kiguchi discloses a flat plate 21 having a

series of somewhat *circular shallow holes* 211 that extend through a *rectangular plate*, neither of which features of Kiguchi can be fairly be construed to be a dispensing tube. Third, the dispensing tube of the present invention itself contains lateral openings from which the fluid exits. Assuming that the plate 21 cannot be construed to be a tube, even if the *shallow holes* 211 of the inkjet of Kiguchi were considered to be *tubes*, the holes 211 are not themselves provided with a series of outlet openings.

For at least these reasons, Applicants respectfully submit that the independent claims 2 and 12 are patentably distinguishable over Kiguchi.

Regarding the § 103 rejections, as Applicants have noted previously, the ink jet printer technology of Kiguchi and Crockett does not constitute analogous art in respect to the apparatus for manufacturing photovoltaic elements of the present invention. Moreover, regarding the rejection of independent claim 18, which has been amended similarly to independent claims 2 and 12, the circulation line configurations disclosed in Crockett fail to address the aforementioned deficiencies of Kiguchi with respect to the tubular dispensing means feature, in particular. The same applies to all the dependent claims rejected under 35 U.S.C. § 103(a), at least by virtue of their dependence from an allowable independent claim, and for the additional features recited therein. Accordingly, all of the independent claims 2, 12, and 18, as well as their dependent claims 3-11, 13-17, and 19-20, are patentable over the cited art.

Serial No.: 10/514,424  
Art Unit: 1792  
Inventor: Rudolf Peter MUIS et al.

Attorney's Docket No.: OCT0013-US  
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In view of the foregoing, all of the claims in this case are believed to be in condition for allowance. Should the Examiner have any questions or determine that any further action is desirable to place this application in even better condition for issue, the Examiner is encouraged to telephone Applicants' undersigned representative at the number listed below.

PAUL, HASTINGS, JANOFSKY & WALKER LLP  
875 15th Street, N.W.  
Washington, D.C. 20005

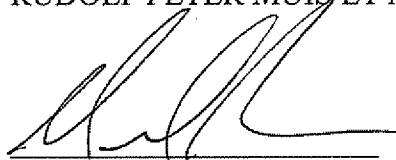
Tel: 202/551-1700

Respectfully submitted,

RUDOLF PETER MUIS ET AL.

Date: June 9, 2009

By:



Michael Bednarek  
Registration No. 32,329

MB/SPA/RAR/ggb  
Customer No. 36183